MOTOROLA
Semiconductor Products Inc.

AN-805
Application Note

THE 5-VOLT, 64K DYNAMIC RAM IS HERE, SO IS THE 32K, SO IS THE 16K!!!

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The 64K dynamic RAM will present us with many new opportunities. For the designer, however, life must go on and he must continue to add as much flexibility as possible into his state-of-the-art designs. The attraction of fourfold increase in density at 1/8 of the power dissipation per bit is very strong. Hardware that was impossible, simply because the designer had physical space limits yesterday, is now possible.

The 64K RAM will lead to decreased board density, because there will be only one power supply plus ground to grid in the printed circuit board layout. It will also take fewer decoupling capacitors (leading to more compact boards and lower costs).

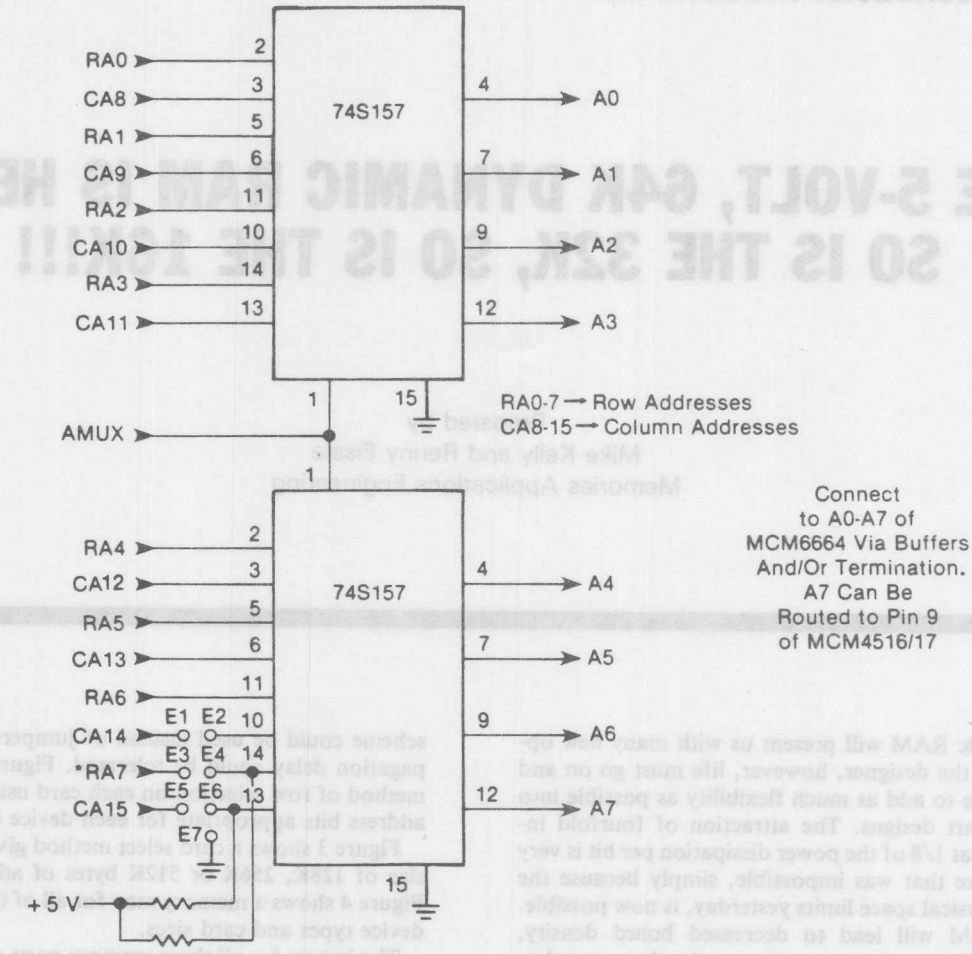
Another idea for small memory systems, which have a good probability of growing as the product matures, is to use our 5-volt, 16K RAM, 32K RAM, and 64K RAM on the same layout. Then, as memory demand in the product increases, the next larger size memory part can be used in production. A single design that supports all three types of 5-volt only RAMs may be achieved by careful planning of addressing at the card edge and physical and logical row selection on the memory card.

Figure 1 shows an address multiplexer with jumpers to achieve the proper addressing for each device type. A gating scheme could be used instead of jumpers if the added propagation delay could be tolerated. Figure 2 shows a simple method of row selection on each card using the higher order address bits appropriate for each device type.

Figure 3 shows a card select method giving a total memory size of 128K, 256K or 512K bytes of addressable memory. Figure 4 shows a memory map for all of the combinations of device types and card sizes.

The layout for all three memory parts should be identical. The memory array should be as compact as possible and all drivers to the memory array should be as close as possible to the array. A good power and ground grid is a must. Even though the V_{IL} specs on these memory parts have been relaxed they will still need input termination. The mismatch between TTL and MOS is too great to allow direct connection.

The designer will find the these new leadership 5-volt parts to be much easier to use than earlier three supply parts, particularly in layout. Keeping the power and ground perfectly gridded on a 2 layer board with a three supply part has taxed many a layout drafter. The relationship beteen the drafter and engineer can return to normal now. Good luck on your designs.



Jumper Chart

	From	To
MCM4516/17	E2	E3
MCM66320	E1	E2
	E3	E4
	E6	E7
MCM66321	E1	E2
	E3	E4
MCM6664/65	E1	E2
	E3	E4
	E5	E6

FIGURE 1

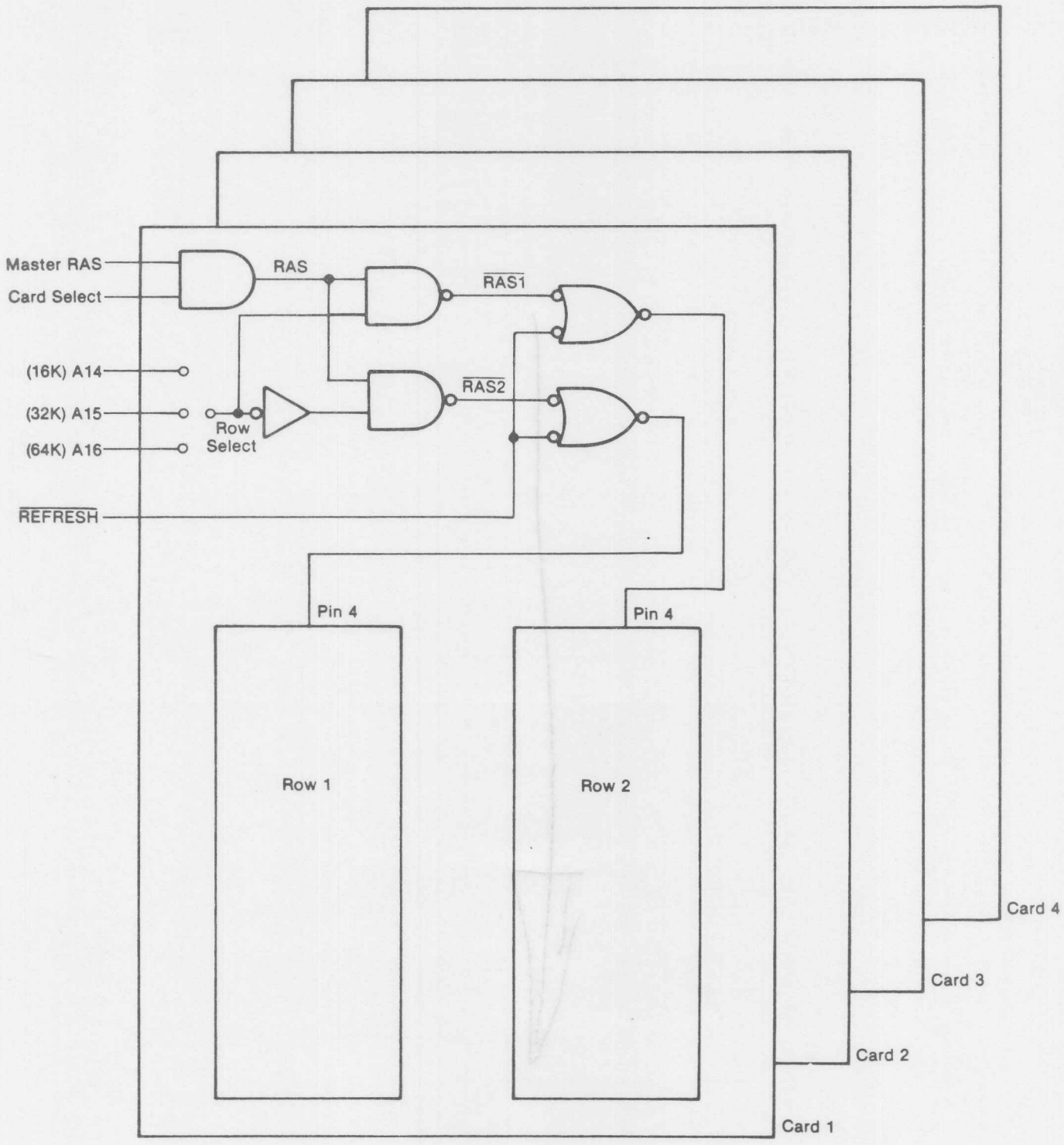
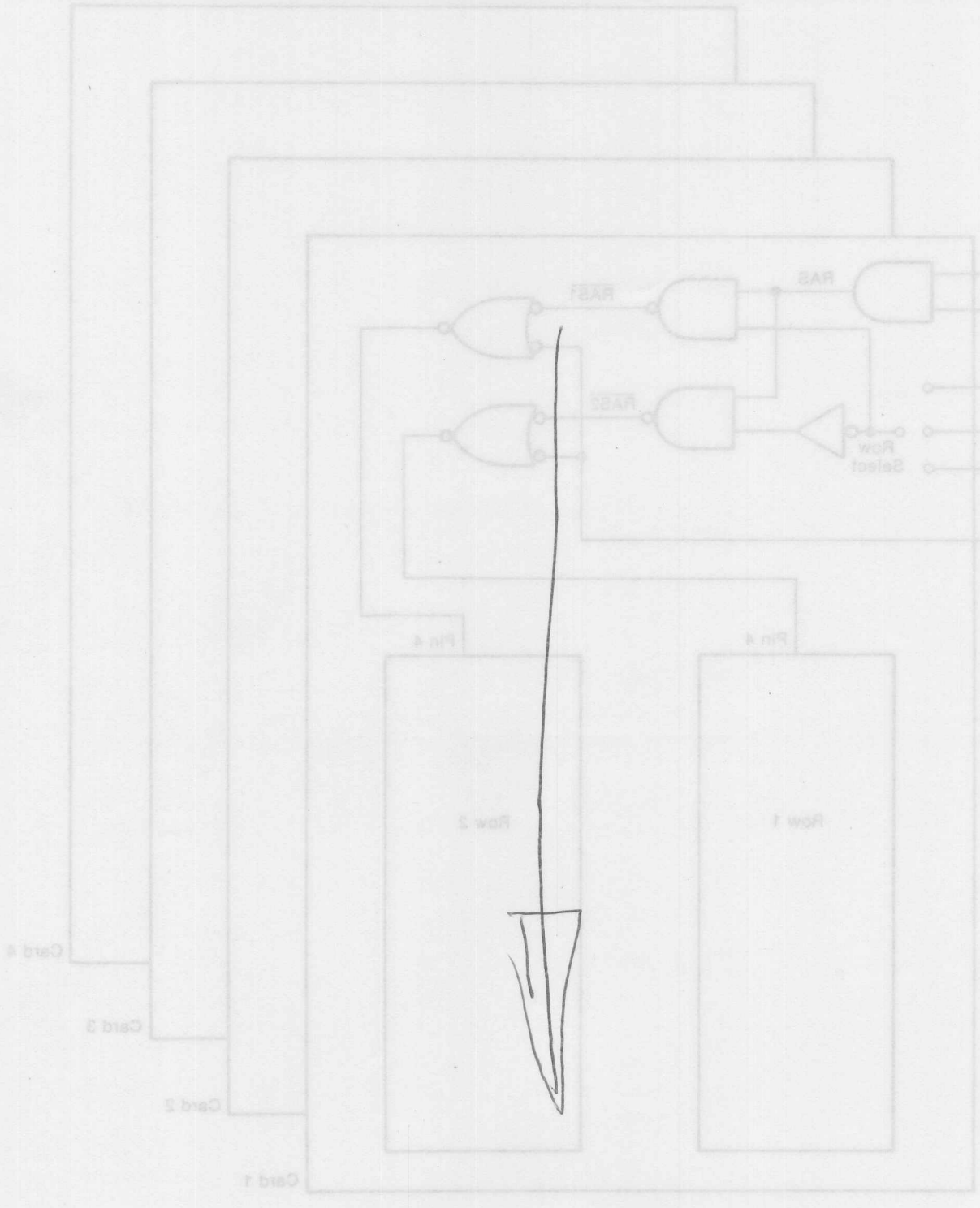
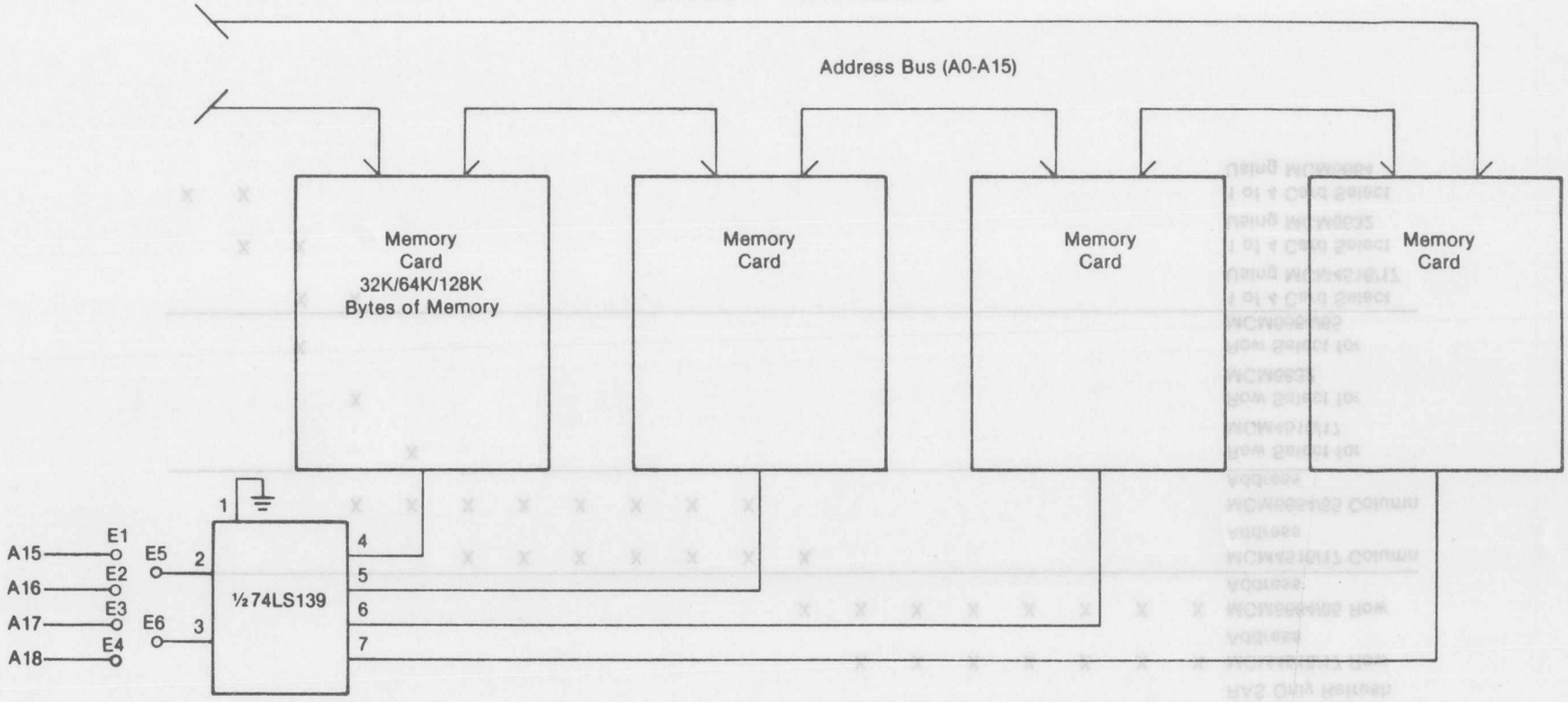


FIGURE 2 — ROW SELECT





Jumper Chart

	From	To
32K	E1 E2	E5 E6
64K	E2 E3	E5 E6
128K	E3 E4	E5 E6

FIGURE 3 — CARD SELECT

19 BIT ADDRESS SPACE FOR 512K BYTES OF MEMORY

A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A	A2	A1	A0	
												X	X	X	X	X	X	X	Refresh Address for RAS Only Refresh
												X	X	X	X	X	X	X	MCM4516/17 Row Address
											X	X	X	X	X	X	X	X	MCM6664/65 Row Address
					X	X	X	X	X	X	X								MCM4516/17 Column Address
			X	X	X	X	X	X	X	X									MCM6664/65 Column Address
				X															Row Select for MCM4516/17
			X																Row Select for MCM6632
		X																	Row Select for MCM6664/65
		X	X																1 of 4 Card Select Using MCM4516/17
	X	X																	1 of 4 Card Select Using MCM6632
X	X																		1 of 4 Card Select Using MCM6664

FIGURE 4 — MEMORY MAP